ICHTHYOTOXIC PLANTS AND THE TERM "BARBASCO"

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One hundred years ago, Richard Spruce wrote a paper entitled "Indigenous Narcotics and Stimulants Used by the Indians of the Amazon", in which he stated: "This does not profess to be a treatise on all known South American narcotics, or I should have to speak of a vast number more, such as (for instance) the numerous plants used for stupefying fish. Some of these, but especially the timbó-acų *(Paullinia pinnata)*, are said to be also ingredients of the slow poisoning which some Amazonian nations are accused of practising . . . " (25). "Timbó" is the more common of two Brazilian terms equivalent to the Spanish "barbasco"; the other is "tingui". It would be the word that Spruce heard most frequently, since most of his exploration took place in the Brazilian parts of the Amazon valley. Since, however, he spent about six months on the Orinoco and its uppermost tributaries and several years in Peru and Ecuador, he must also have been familiar with the term "barbasco".

I

"Barbasco" is a generic term in Spanish-speaking countries of South America for ichthyotoxic plants. Although it is customarily applied to all plants with this property, a qualifying or descriptive term is occasionally added. Thus, *Lonchocarpus Nicou* is often referred to as "barbasco legítimo" (genuine barbasco) or *Tephrosia Sinapou (T. toxicaria)* as "barbasco de raíz" (root barbasco). Actually, neither of these terms was current among New World Indians utilizing plants as piscicides; they had their own names for fish poisons, such as "hairi" (Guyana) or "nekoe" (Surinam).

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Rudd (21) reports the use of a vividly descriptive name used in Florida, where a *Piscidia* is known as "Jamaica fish-fuddle tree" or "Florida fish-fuddle tree". It is likely that this name is used also in Jamaica since, as Rudd points out (pers. comm.), the name "sounds like an English-West Indian concoction" and states that the generic epithet *Piscidia* and its synonyms *Piscipula* and *Ichthyomethia*, were based upon the observations that Jamaican natives used these plants to poison fish.

The term "barbasco" comes from *Verbascum*, a genus of the *Scrophulariaceae*, some members of which have been utilized for centuries as piscicides throughout Europe and around the Mediterranean. The common mullein, *Verbascum Thapsis*, is the species most often mentioned. At least two other species, *V. sinuatum* and *V. undulatum*, are said still to be in use for this purpose in Greece.

The Spanish words for mullein are "verbasco" and "gordolobo". As the Venezuelan lexicographer Lisandro Alvarado (1) points out, however, the spelling "barbasco" is very old and is connected with "barba" (beard). According to some authorities, the name of the genus should correctly have been *Barbascum*, in reference to the bearded stamens and the generally woolly appearance of these plants. Another possible and perhaps more logical explanation of the "b" rather than the "v" may be the interchangeability of "b" and "v" in Spanish usage. "Barbasco" does not appear in the Spanish Academy's *Diccionario de la Lengua Española*. The entry "varbasco" refers the enquirer to "verbasco", where it is stated that "verbasco" is "gordolobo" (mullein) and that the seeds of this plant are used "para envarbascar el agua" (to poison water). No further explanation is here offered, but a search discloses that "envarbascar" means "to poison water with verbasco" or a similar substance, to stupefy fish. Indicative of the validity of the use of the term "barbasco" is its inclusion in Santamaría's *Diccionario General de Americanismos*, where neither "varbasco" nor "verbasco" appears.

Since Old World fish-poisoning goes back at least to Classical times and since this use furnishes a background to the interpretation of many aspects of New World use, it merits a brief discussion.

The history of fish-poisoning is summed up by Ernst in a monograph published in 1861 (4). Ernst, who came to Venezuela in 1861 and who published some 400 papers on botany, zoology and related subjects, states that, to the best of his knowledge, his monograph is "the first attempt to present this subject as a special study". Ernst cites Aristotle's reference in his *History of Animals* to fish dying of "plómos", with which the Greeks fished in certain rivers and reservoirs. He further states that the Phoenicians caught ocean fish in this way. Although there are dissenting opinions, most translators agree that "plómos" is a plant. Ernst believes this to be true, since even today, in Greece, *Verbascum sinuatum* is known by the common name "plómos" or "phlómos". Nevertheless, he warns that Aristotle's word "plómos" might refer to more than one plant, since vernacular names are often confused or are applied to plants with actual or fancied similarities. Ernst also refers to Dioscorides' mention of a plant known as "tithymalos platyphyllos" which resembles "phlómos" and which, crushed and thrown into water, kills fish. This plant, *Euphorbia Platyphylla*, is toxic to fish. Ernst quotes Pliny's statement, "pisces necat".

Verbascum was used for drugging fish in Spain during the Moorish occupation. King Juan II prohibited its use in 1453, and his edict was followed by similar laws under Carlos I and Felipe II. In 1805 the law read: "from now on, no person of whatever rank or condition he be, may throw into rivers quicklime bait, nor henbane, nor flax-leaved daphne, nor mullein, nor any other poisonous substance with which fish are killed or stunned".

Obviously, then, the use of *Verbascum* — verbasco or barbasco — was common enough in Spain so that Spaniards arriving in the New World and encountering fish-poisoning as a native technique, would apply to plants so employed, the common name of familiar plants used for the same purpose.

Ernst further speculates about the reason that Spain did not extend this prohibition of fishing with poisons to the American possessions. In 1828 a law was passed in Venezuela stipulating that "no owner of a hato (cattle ranch), owner of a farm, overseer, or anyone whatsoever, may fish with barbasco or other kinds of poison in those streams or rivers which, although on their lands, can endanger cattle or their neighbors" (1). In spite of this law, fish-drugging is practiced to this day in remote areas of the country, and apparently goes unpunished.

II

The stupefying of fish to secure food in quantity with relatively little effort is one of the most widespread and possibly one of the oldest activities of primitive peoples. In the Old World, it has a long history in diverse areas. Although the plants used there differ in toxic constituents from those of South America, the techniques employed the world over are strikingly similar.

Since reports of fish-drugging in the New World were available only after the Discovery, its antiquity there cannot be determined. Accumulated evidence sustains Heizer's conclusion (9) that " . . .we are dealing with a single, widely distributed concept which has a South American focus of origin, dispersal center, and highest and most complex development . . ." To support this conclusion, he mentions the presence of rivers and streams rich in fish and of many plants appropriate for this use. Heizer's tables of regional fish-poison plants — among the most comprehensive available — are based on lists published by Ernst, Greshoff, Rostlund and Howes, as well as Radlkofer, and are supplemented by material from various ethnographical accounts. He issues a *caveat:* "these [tables] are not complete, and give only a sampling of the plants used and places where piscicides are employed".

Going a step further than Heizer in pinpointing the focus of origin and a dispersal center for the use of fish-poisoning plants, Hornell (10) and Schultes (22) suggest that it lies in the Amazon basin. Denying that independent invention may account for this trait, Schultes comments: ". . . this continent seems to represent the center from which this custom has developed in the greatest degree, to judge from the number of species used. Moreover, recent studies have indicated that the area of the northwest Amazon may easily be considered as the epicentre of greatest degree of development of fishing with poisons in all South America".

Schultes has spent many years in exploration of the Amazon flora. He and his students have found sundry new fish-poison plants in the northwest Amazonia of Colombia, some of them new to science and some in families never suspected as having toxic principles. Several of these are cultigens of such age that they are no longer known in the wild state. He reports that the most commonly used in the area belong to the genera *Phyllan-*

thus (Euphorbiaceae), *Clibadium* (Compositae), *Tephrosia* (Leguminosae), and *Lonchocarpus* (Leguminosae). *Philodendron craspedodromum* (Araceae) represents a new and local fish-poison plant the use of which involves an unusual technique not hitherto reported in the literature. The Desana of the Vaupés gather the leaves of this aroid and tie them into bundles which they leave on the forest floor for two or three days to ferment. The leaves are then crushed and thrown into the water. Nothing is known of the chemistry of this plant. The same lack of chemical knowledge holds for other fish poisons recently discovered, such as the bombacaceous *Patinoa ichthyotoxica* among others (22, 23).

Parallels of this process of fermentation of the leaves of *Philodendron craspedodromum*, which may alter the toxins or their effects, are found in the preparation of two Old World piscicides which are lightly roasted before use (8, 11). One, *Ophiocaulon cissampeloides*, contains free hydrocyanic acid; the other, *Jagera pseudorhus (Cupana pseudorhus)*, is cyanophoric. Subjection to gentle heat would seem to be a means of heightening the toxic effects, and fermentation might well act somewhat similarly. Descriptions of the preparation of *Manihot esculenta*, — which itself can be used as a piscicide — mention both heat and soaking as altering its toxicity, due to the presence of a cyanogenic glycoside.

The discovery of new piscicides in the northwest Amazon suggests that the focus of origin and dispersal center of their use may extend beyond this area. The Orinoco basin with which it merges and the tribes of which share culture traits with its peoples, may also prove to be significant. Up to the present, comparatively little botanical and ethnological explorations have taken place along the Middle Orinoco. This possibility, as well as that of independent invention, should therefore be considered in the drawing of conclusions.

Plants used as fish poisons may be lianas, bushes, or small trees. Depending on age and other conditions, the same plant may be all three of these in form. Its effectiveness as a piscicide may vary with seasons, since the concentration of the toxic constituents may vary not only with location but also with time of year. The plants may grow wild or they may be cultivated in small plots or even in large plantations called "barbascales" (13). Their cultivation, as with certain food plants such as maize and manioc, elevated fish-drugging from a hunting-fishing trait alone, to that of a sedentary, agricultural level of economy (11). Some fish-poisoning plants have been cultivated so long that they are no longer known in the wild.

III

Whether the toxic plant be called "varbasco", "barbasco", "timbó", "plómos" or any number of local names, the purpose and technique of fish-drugging are almost identical wherever this method of catching fish has been noted. The purpose everywhere is to catch a large quantity of fish with the least effort and in the shortest time. The technique presupposes not only this need but also certain practical knowledge. "The universal feature of fish-stupefying is simply the recognition of a narcotizing, sometimes lethal effect on the fish by introducing the poisonous principle of a plant into the water. An effective plant piscicide must fulfill certain conditions, among which are solubility, rapid diffusion in the water, and high potency . . . and it must have such an effect that the fish itself does not have a toxic quality when eaten by humans" (9). Either a pool or a sluggish stream is selected for the operation, or a rough dam is constructed to make a temporary pool. In either case, an area suitable for restricting and concentrating the action of the poison and for penning up the fish is essential.

The toxic principles of piscicides differ. Some are tannins, some alkaloids, some glycosides. Whether fish die or are only stupefied may depend on the kind of toxin, the strength or concentration of the poison, and the size of the fish (17).

In the most common type of fishing with toxic plant material — introduction of crushed vegetal material into the water — the animal's respiratory apparatus is affected, apparently paralyzed. Fish rise "gasping" to the surface. There is also some evidence that certain poisons affect the nervous system (9). In any case, the result is a stupefying effect followed usually by death, unless the fish are able to escape from the poisoned water.

There are various methods for introducing the poison into the water. Sometimes, crushed plants or parts of plants (such as bark or root only) are thrown directly onto the surface of the entire area to be fished. On other occasions, the crushed material is placed in a canoe with a little water, where it is stamped to extract the active principle. Then either the canoe is overturned into the pool or its contents are ladled out into the water with calabashes to distribute the poison. Often, the crushed material is placed in loosely-woven bags or baskets which are then plunged up and down or dragged through the water. A variant of these procedures, reported by Schultes (pers. comm.), is employed in eastern Colombia by the Kubeo. They pound the fruits of a species of *Caryocar* (Caryocaraceae) in a mudhole. The resultant mixture of fruit pulp and mud is then cast into pools. Fishing with toxic plant material is always a collective enterprise in which several or many men participate. It is not customary for the women of most South American groups to take part in the actual fishing, though they may sometimes carry the catch to the village. It is not certain, from reports, whether or not barbasco (timbó) fishing in central Brazil is exclusively a masculine operation. It is stated that the women carry the catch back to the village to avoid bringing bad luck to the fishermen (16).

In a somewhat different type of fishing, characteristically practiced by women, plants which act as a stomach poison are utilized. The plant material is ground, mixed with a substance attractive to fish, and made into small pellets which are thrown into the water. Among these is cuna (an Achagua word for barbasco (19), probably *Tephrosia* spp.) the root of which is mixed with maize dough. Another is *Clibadium asperum*, which is mixed with finely chopped meat. Most accounts of the use of toxic plants describe the fish as stunned and sometimes dying almost immediately, rising to the surface within a few minutes after the poison is thrown into the water. With the use of some stomach poisons, however, hours or even days may elapse before they appear on the surface. Results are believed to vary depending on the type of toxin in the plant utilized. Alkaloids seem to produce more immediate effects than saponins and tannins (11).

A notable characteristic of fish-drugging is its recreational aspect. The men of a primitive community regard a fish-poisoning expedition as a holiday from their daily tasks. It cannot be considered a sport, though it provides a diversion, since for these peoples it is a necessary part of the food quest.

One of the few early European eyewitness descriptions of two kinds of fishing with plant poisons by South American Indians is that of Father Joseph Gumilla, a Jesuit missionary in the 1700s to groups along and near the Orinoco between the Meta and Apure Rivers. Gumilla confines himself to procedures and omits mention of special body-painting for barbasco expeditions — a significant detail which is described by his fellow-missionary, Father Juan Rivero.

Attributing choice of designs to individual caprice, Rivero states that they use their finest paints — black, yellow, red, white — to apply circles around their eyes, spots on their cheeks, lines down their noses, and their entire bodies red (19). Both Gumilla and Rivero most probably refer to the Achagua, among whom were their mission Indians.

Gumilla(7) describes fishing by both men and women. Of the first, he writes: "They . . . fish in small rivers and brooks to vary their diet or for amusement. They grow two kinds of roots for this purpose, one called 'cuna' . . . similar to turnips except for the smell and taste; each is harmful to the fish, crushed in the water; it is enough for them to smell it and they are intoxicated and stupefied in such a way that the Indians can go about putting them into their baskets with their bare hands. . . . The other root with which they fish is called 'barbasco' and is of the same color and shape as the stock of a grapevine, and also has the strength of cuna. This is a very diverting kind of fishing, and ordinarily very merry for the Indians; because to this one, as it jumps out of the water, a fish gives a slap in the face or to another a tap in the ribs; the rest . . . make fun of this; then the same thing happens to them, which makes them laugh."

The second kind of fishing described by Gumilla was done by women and children: "Very easy, and odd, is the way the Indian women fish with cuna. They grind cooked maize and set aside a ball of that dough. With the rest, they grind one or two cuna roots . . . They go to the nearest river or stream and throw in the dough which is not poisoned; a great number of sardinas, codoyes, and other medium-sized fish gather around the dainty. When they have them enjoying the tidbits, they take the other dough which is poisoned with cuna, and their children go into the water . . . below the pool, each with his basket . . . they throw in little balls . . . and when the fish swallow them, they become intoxicated and motionless . . . . The current carries them downstream and the youngsters collect them with much noise and shouting. It is certainly an unusual way to fish, and aside from its usefulness, is an amusement."

Whereas Gumilla presents a very human scene observed by a sympathetic outsider, Goldman records the anthropologist's view in a report of the Kubeo of the Colombian Vaupés (6). Fishing is one of the tribe's regular male-oriented activities. Since the basic Kubeo diet consists of manioc and fish, fishing is an important part of the food quest. Fishing is usually individual, by a man (sometimes accompanied by a young son) in a canoe, with a hook and line, or — in the shallows — with a bow and arrow. However, during the summer, when the water is low and fish are trapped in shallow pools, collective fish-poisoning parties are occasionally organized. One group of the men puts up a weir; another gathers and prepares the poison. The nature of this poison is not mentioned, but the word "gather" suggests a plant. According to Schultes (22) the Kubeo utilize the stems and roots of two connaraceous vines *(Connarus opacus* and *C. Sprucei),* in addition to the usual types. Each man loads his catch in his canoe, collecting the stunned fish with his bare hands or with a net, or shooting with bow and arrow, large fish still able to move. The total catch is later distributed to each household. This fishing is accompanied by horseplay and by jocular remarks to the fish themselves.

The detail about addressing the fish may not be, as implied, a general and casual joking situation. Goldman supplements the above account with a description of a festival which takes place only when the Indians are in the mood for it. Each man mounts a dried fish on a stick and dances with it. The dancers wear headdresses shaped to resemble a fish-basket and carry staffs decorated with the feathers of fishing birds — the heron and the river eagle. They sing songs honoring the fish. The ritual or ceremonial character of this festival is denied by the Kubeo. Goldman (6) suspects that either they no longer recognize the instrumental motive or else refuse to acknowledge it, since they insist that it is not intended to increase the catch.

Features of collective barbasco fishing among the Desana (18) seem to have significant overtones. These Indians, who, like the Kubeo, inhabit the Colombian Vaupés, prepare themselves ritually for fishing as well as for hunting. They observe a special diet beforehand and make themselves attractive to the fish with special designs of face-paint for which they use a red pigment and the sap of plants. Motifs representing fish fins and eyes are painted on the cheeks. A Desana fisherman carries with him a tubular container made of deer or peccary bone containing a supply of pigments so as to alter these motifs in accordance with the kinds of fish he may find. In addition to these precautions to secure quantities of fish, the Desana shaman invokes the help of the Master of Fish. His invocation will "open a path", so that the poison will be effective. Women do not participate in the fishing but are obliged to bathe in the water where the toxic material is being thrown. If they have any share in the operation, it is only when many hands are needed to collect the catch.

Why do the Kubeo, the Desana, and many other groups attach more than mundane importance and significance to the utilization of barbasco? Evidence of magic associations here — as in many other aspects of the food quest among primitive peoples — may be found in their myths and beliefs about food plants and animals. Barbasco itself is of supernatural origin, as recounted in myths (16) the consistency of which throws much light on the custom of utilizing fish poisons. For example, the death of fishes is frequently associated with the bathing of a human being in the water where they swim. The Desana bring about this association by having their women bathe in the water into which they throw poisonous plant material so that many fish will be stunned and die. The fish-dance of the Kubeo and its accompanying songs honoring the fish, their addressing the fish during the fishing operation, as well as Desana face-painting in pisciform patterns thought pleasing to the fish, are procedures designed to secure the prey's favor and cooperation by magical means.

Ritual purifications by rigorous diets or by abstention from sexual activity for a certain period, typified by the Desana (18) and the Makiritare (26), are examples of taboos, observance of which is believed to give man magical power to achieve a desired end.

Fishes, like other animals, have a Master or Owner. They are the "people" of these guardian spirits who watch over and protect them. Long ago, it is recounted, men did not kill more animals than they needed for food, and therefore, these spirits helped them to fish and hunt. But when men began to kill large numbers of animals and to waste them, their Masters became ambivalent in their attitude. Therefore, their help must be ceremonially invoked by an individual whom they respect, the shaman. Also, precautions must be taken not to incur their ill will or their anger.

The Warao of the Orinoco delta fish reluctantly with piscicides, because they are an essentially fishing people and are afraid of offending the Owner of Fish, who will move away, taking all his "people" with him if too many of them are killed or wasted. They use barbasco only in inconspicuous places, where they hope their fishing will pass unnoticed. A Warao will preserve the larger fishbones in the roof-thatch of his house along with other objects that he believes have magic qualities, to ensure the good will of the Owner of Fish — and his own future luck in fishing (26). It is not known whether he shares a widespread belief among primitive peoples that, if the bones are preserved, the soul of the dead fish is propitiated and may even return to life, clothed anew in flesh.

IV

Because of wide distribution and similarity of techniques, fishing with piscicides (mostly of plant origin) must be assumed to be very ancient. Since by its nature this occupation cannot have left vestiges in material cultures, it is only on reports of observers that any facts or theories can be based today. As the earliest observers were not trained scientists, much that they have recorded must be accepted *cum grano salis*. Modern reports may also be deficient. For example, a botanist may fail to mention significant details of procedure, and an ethnologist to give clues as to the identity of a plant.

One interesting type of surviving evidence of the use of piscicides by primitive peoples and their beliefs about them may be found in myths. Originating in pre-literate societies, they reveal as perhaps nothing else can, basic attitudes and beliefs. Evolved from the life-experiences of generations, transformed again and again by countless re-tellings, myths form a body of "truth" often more significant than facts can ever be.

Several "origin" myths of South American Indian tribes (16) tell of the origin of fish poisons. According to an Arawak myth, "an old man who was fond of fishing one day took his son with him to the river. Wherever the lad swam, the fish died. And yet it was safe to eat them. The father took the lad with him to bathe day after day, until the fish knew of his plans and resolved to defeat him. They made up their minds to slay the boy. They dared not attack him in the water, so they chose as the scene of the slaughter an old log where the boy, after his swim, would bask in the sun. There the fish attacked him, and the stingray fatally wounded him. The father carried his son into the forest. When the dying youth saw his blood drop onto the ground, he told his father of the curious plants that would grow wherever his blood took root, and he forecast that the roots of these plants would avenge his death."

The plants, of course, were barbasco. This myth is strikingly reminiscent of the Greek myths about Hyacinthus, from whose blood, dropping on the ground, sprang the hyacinth; about Ajax, from whose spilled blood a flower sprang up bearing the letters AI (woe) on its petals; about Adonis (Tammuz in Syria), from whose blood anemones sprang.

An Arecuna myth from Guyana recounts how a woman bathed a male child in a river, and quantities of fish died. Consequently, she washed the child each time there was a shortage of food. Finally the boy was killed by a supernatural being under the surface of the water. The woman put the body into a basket to carry it home. Blood oozed from the basket, then pieces of flesh fell out of it, creating timbó.

In a myth of the Mundurucú of the central Amazon, a frog-sorcerer told a woman whose body was covered with soot to bathe in the river, but warned her to face upstream and not to look behind her. The soot was washed off and it had the effect of timbó; fish died on the surface after beating the water three times with their tails. But the woman turned around to see what was causing the noise, and the fish came back to life and swam away. When the frog-sorcerer came to collect the fish he was furious. If she had obeyed him, he told her, Indians would no longer have to look for wild timbó.

A Carib variant, suggestive of the punishment in the garden of Eden, begins: "In ancient times, men knew nothing of disease, suffering and death. . . ." The spirits of the forest then lived with men. An Indian woman cruelly murdered the baby of one of these spirits. In her grief, the spirit declared that henceforth the children of men would also die and also know grief. And men would no longer be able to drain pools and pick up fish but would have to work to find roots with which to poison them.

These and many similar myths lead to a conclusion that fish-poisoning techniques must have been known by South American Indians for uncounted generations and that at least one piscicidal plant was counted among the magical and, therefore most important, bases of their existence.

V

The moot question of diffusion versus independent origin arises anew when the question of plant piscicides in North America is considered. There is ample evidence of their use in both southeastern and western North America, but apparently none were employed between the Mississippi River and the Great Basin. There is not enough literary source material to assume a connection between the Gulf Coast and Mexico. Consequently, "it seems likely that [the southeastern United States area of piscicides] may be related to the Antillean (and ultimately South American) area of fish-drugging" (9). Successive Carib and Arawak migrations into the Caribbean from northern South America might account for the presence of piscicides in the Antilles, just as it accounts for the snuffing of *Anadenanthera peregrina* and other culture traits involving plants. Heizer (9) lists the following fish poisons employed in the southeastern United States; Choctaw, Delaware, Creek, buckeye *(Aesculus* sp.*)* nuts; Cherokee, Delaware, walnut *(Juglans* sp.*)* bark and green nuts; Catawba, black walnut*(J. nigra)* nuts; Yuchi, devil's shoestring *(Tephrosia virginiana)* roots; Florida, Jamaica dogwood *(Piscidia piscipula)* and dogwood *(Cornus* sp.*)* roots.

A somewhat different list for this area has been offered (20): (north to south) Indian turnip*(Arisaema triphyllum);* pokeweed *(Phytolacca decandra);* devil's shoestring *(Tephrosia virginiana);* buckeye *(Aesculus* sp.*); Cocculus carolinus,* sometimes called "false jessamine". Several species of *Aesculus* are called "buckeye". The most likely to have been utilized in this area is *A. pavia,* the red buckeye. The common name of *Cocculus* is "Carolina moonseed", a climbing vine found from Virginia to Florida. False jessamine is probably *Gelsemium sempervirens,* a climbing vine found from Virginia to Florida and Mexico, all parts of which contain poisonous alkaloids.

Rostlund (20) concludes that it is not safe to assume that fish poisoning was an aboriginal trait in eastern and southern United States: he suggests that it could have been introduced in relatively recent times, possibly by Europeans or by Africans from the West Indies.

Available comments are contradictory and evidence is sparse. Plant piscicides may have been used infrequently by Indians and consequently may not have been noticed by observers or were not considered worthy of mention. Why, for example, did William Bartram, a keen observer and a competent botanist, not mention this custom?

Early reports from this area, do, however, include details of interest in an overall picture. The procedure described is like that of South American utilization of plant material: the plants are pounded, steeped in water in a trough, and scattered on the surface of a pond which is then stirred with poles to spread the poison; the stunned fish are collected in baskets. In South Carolina, nuts of *Aesculus pavia* were ground and mixed with wheat flour to make a thick dough which was thrown into the water. It is not clear whether this was an Indian or a European practice.

The picture in western North America is no clearer than in the southeast. Rostlund states that, as far as he knows, the earliest report of fish-poisoning in that area was made by Powers in 1877. He believes it improbable that the trait could have been introduced at that time and concludes that it "seems safe to think that it was aboriginal on the west coast".

Plants utilized in this area (north to south) are: toza root *(Leptotaenia dissecta);* a plant called by variants of the name "Solomon" *(Smilacina* spp.*);* turkey mullein *(Eremocarpus setigerus);* blue curl *(Trichostema* spp.*);* soaproot *(Chlorogalum pomeridianum);* manroot *(Echinocystus* sp.*);* buckeye *(Aesculus californica).*

Ample evidence is available of the use of fish poisons in northwestern Mexico, and it is known that California Indians utilized such plants as turkey mullein, soaproot, and the buckeye. There is a great block of tribes between these two centers, however, that did not eat fish. Heizer concludes that if a historically connected Mexican-North American practice of narcotizing fish existed, it must either have started to the west of the areas where fish were not eaten, or was transferred — probably along the coast — before a taboo against fish-eating was in operation.

Rostlund's suggestion that possibly the use of plant piscicides was introduced into southeast North America by Africans from the Caribbean (possibly by escaped slaves) or by Europeans, is mentioned by Heizer. One introduction by Europeans is discussed by Wilhelm (27), but since contact between Indians and settlers does not seem to be involved, this example cannot be accepted as an instance of the effective introduction of a technique. It may rather represent simply the use of an already known procedure in a new environment.

VI

Quite aside from the great age of use of piscicides among primitive peoples, and returning to *Verbascum* and the common term "barbasco" — there remains the question of the use of mullein *(Verbascum* spp.) described by Wilhelm among the mountaineers of the southeastern United States.

These people, who were of English, Scotch-Irish and German descent, emigrated to the Blue Ridge area in the 1700s. For food, they had to rely on hunting, fishing and gathering until their harvests became dependable. Although there were at least twenty species of fish in the region, these settlers — except for those who already had a fishing tradition — much preferred hunting or collecting to fishing. However, some of them did fish regularly. They built dams, fish weirs or traps, and they used mullein as a piscicide. A native of this region, whose ancestors had come to America from Germany about 1780, described how his grandfather had used mullein in Europe.

"They'd heard 'bout the new land . . . 'n decided to bring things that'd help them git a start," he said. "Stinging fish [drugging] was one easy way of gettin' food at first, so Feltwort [German common name of mullein] seeds were brung along." Other dwellers of the region commented that fish-poisoning had been practiced "on the sly" by their families in Europe. Inasmuch as these settlers had been working people or farmers, it is quite likely that there they had indulged in a little poaching. Fish-drugging is a poacher's technique in the British Isles, as opposed to the gentleman's method of fishing with hook and line (9). Fish-drugging has been practiced in nearly every European country. There are many specific references in old writings to the use of this technique in Greece, Italy, Spain, France, the Netherlands, Germany, Russia, Ireland and England.

Their knowledge — and mullein seeds — stood these mountaineers in good stead as settlers in a strange land. The women set aside a place in their dooryard gardens for mullein plants — the more especially because, aside from the use of its seeds for fishing, mullein was considered a valuable household remedy. Common mullein *(Verbascum Thapsis)* is a coarse plant which grows from two to six feet high, with a stout, erect stem and a basal rosette of large, velvety leaves. It has tightly-packed yellow or (rarely) white flowers. This is most probably the species brought by these settlers, which, escaped from their Blue Ridge gardens, augmented the weedy flora of the region.

As far as informants remembered, fishermen crushed mullein seeds, mixed them with a little water, and dumped the mixture into a stream. The stunned fish came to the surface, gasping and struggling, and were collected in nets or baskets. Fewer than a dozen people usually participated in these "fish stings", but cooking and eating the catch was a social event for the whole community.

Although *Verbascum Thapsis* is an introduced plant, not native to the New World, the mullein of the Blue Ridge settlers was not the first mullein to grow in North America. A century earlier, before these people brought seed from Europe, mullein grew in New England. John Josselyn, in his *New Englands Rarities,* lists the "mullin [*sic*] with the white Flower" as among "Such Plants as have sprung up since the English Planted and Kept Cattle in New-England" (12).

What species of mullein Josselyn mentions as having been brought to New England before 1621 is uncertain. He mentions a white flower. *Verbascum Thapsis,* does, rarely, have white flowers. Tuckerman, who added notes to Josselyn's account, states that a white floured [*sic*] mullein listed in Gerard is perhaps *V. Lychnitis,* adventive in some parts of the United States. This species is sometimes called "white mullein", but it is scarce and its flowers may be either yellow or white. Another possibility is *V. Blattaria,* the moth-mullein, the flower of which may be white, yellow, or purple-tinged. Since Tuckerman observes that *V. Thapsis* was "common in Cutler's time" — that is, certainly by 1785, when Cutler published a list of plants found in the Massachusetts area — it is very probable that this species is the "mullin with the white Flower" to which Josselyn refers.

Josselyn does not mention the piscicidal properties of mullein. This role of the plant seems to have "gone underground" as a result of laws in many countries prohibiting its use for fishing. By the mid-1700s, its ability to stupefy fish was doubted, although it continued to be valued as a cure for various ills, including coughs in cattle and humans and as a remedy for inflamed eyes. The plant produces a mild narcotic, and tea made from it is said to have a sedative effect.

Verbascum, known commonly as "mullein" in English and as "gordolobo" in Spanish, and bestowing its name, as "barbasco", on hundreds of unrelated plants used to drug fish, apparently has been a servant as well as a companion of man for many hundreds of years.

NOTE: The aboriginal method of obtaining quantities of fish by dispersing ichthyotoxic plant material (collectively known as "barbasco") in water, is employed in a modified form in the United States today. The purpose is primarily for "fish control", to eliminate undesirable species preparatory to stocking with trout. According to Dr. Robert S. McCraig, aquatic biologist (Division of Fisheries and Game, Commonwealth of Massachusetts), various commercial preparations (usually of rotenone, the active principle in many types of barbasco) in the form of finely milled powder or an emulsion, are utilized in the same way that plant material is used by primitive peoples.

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PLATE 13

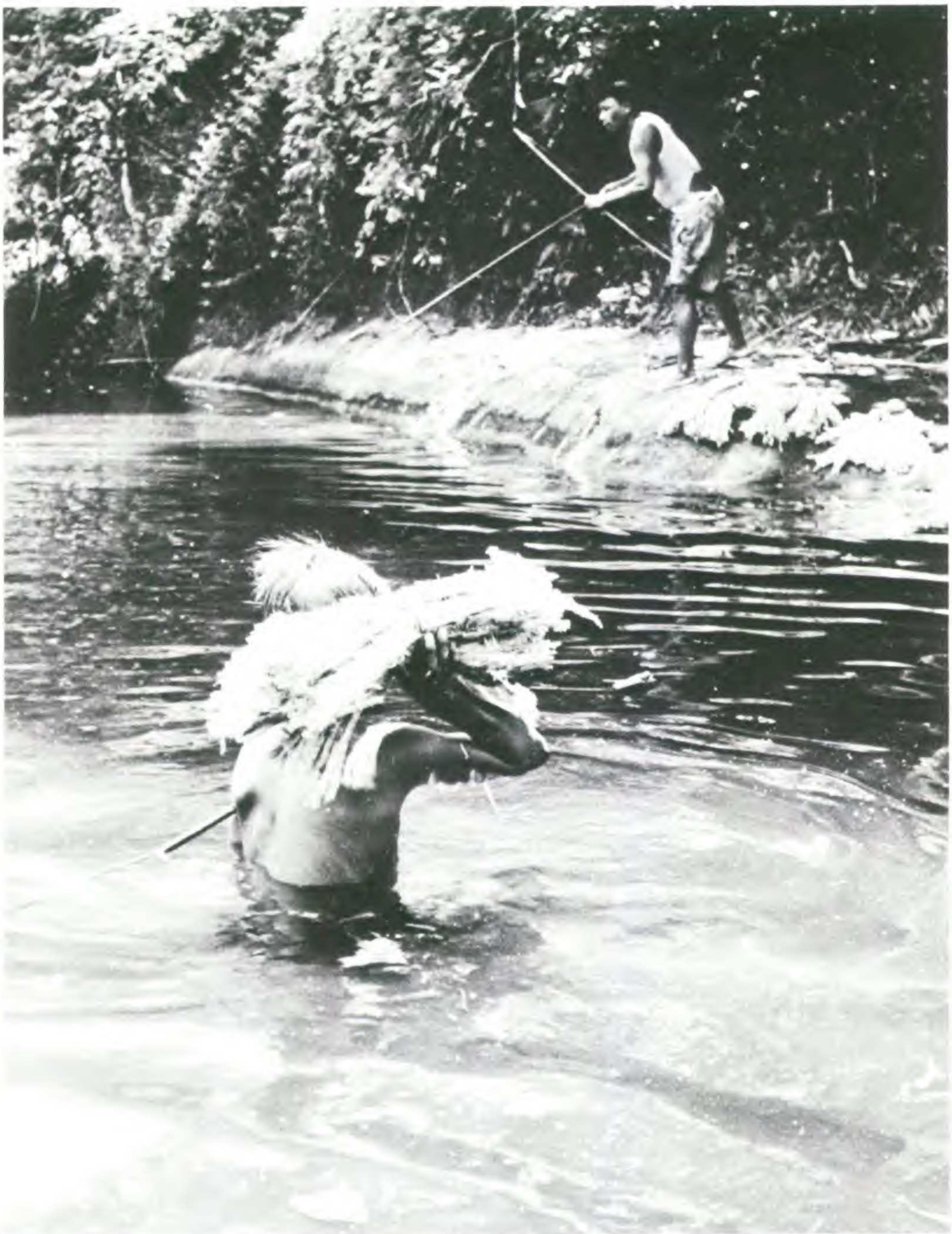

Plate 13. Kamarata fishing with barbasco near Angel Falls, Venezuela.
Photograph by Ruth Robertson